

JavaFX

Datasources:

Getting Real-World Data into JavaFX Controls

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Disclaimer

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The Problem

Manager: “Bob, our users are complaining we aren’t showing them enough information”

Bob: *internalises anguished scream, already knowing what the next sentence is going to be*

Manager: “We need you to add a table into our app that shows all the information that is missing”

Bob: *facepalm*

Problem Statement

- Getting data into a Table can often be difficult:
 - Bringing data into memory
 - Massaging data
 - Loading data into table efficiently (maybe on-demand)
 - Displaying the data can be tricky
 - Allowing editing of data (with proper bindings to the data source) can be complex
- Hint: We think we have some code in this talk that may help...

Outline

- Intro to JavaFX 2.0 TableView / ListView controls
- Retrieving/parsing/rendering data
- Mapping data with controls
- Static and dynamic data
- Cell factories
- 'EnergyCo' Example

JavaFX 2.0 Controls

- Primary focus of this talk: `ListView` and `TableView`
- Common API:
 - Both have a generic type
 - 'items' `ObservableList`: the raw data.
 - 'cell factory' support: the renderer of the raw data
- JavaFX Controls leverage generics, e.g.
 - `ListView<T>`
 - `TableView<T>`
 - `TreeView<T>`
- With `<T>` the type of the objects contained within the control.

Creating a ListView Instance

```
// Get the data that we want to show in the ListView
ObservableList<Person> people = ...

// Create a ListView control
ListView<Person> peopleList = new ListView<Person>();

// Set the data in the items list (or just pass in to the constructor)
peopleList.setItems(people);
```

Creating a TableView Instance

```
// Get the data that we want to show in the TableView
ObservableList<Person> people = ...

// Create a TableView control
ListView<Person> peopleList = new ListView<Person>();

// Set the data in the items list (or just pass in to the constructor)
peopleList.setItems(people);

// Create TableColumn instances for each column we want
TableColumn<Person, String> firstNameCol = new TableColumn<>("First");

// Tell the TableColumn how to extract the value from the row object
firstNameCol.setCellValueFactory(...);
```


What Is A Cell Value Factory?

- Each TableColumn needs a Cell Value Factory
 - Otherwise the column will be blank
- It tells the TableColumn how to extract a value for a cell from a single item from the TableView.items list
- It is a `Callback<CellDataFeatures<S,T>, ObservableValue<T>>`
 - S is the type of the TableView
 - T is the type of the TableColumn

Creating Cell Value Factories

```
Callback<CellDataFeatures<Person, String>, ObservableValue<String>> callback =
    new Callback<>() {
        public ObservableValue<String> call(CellDataFeatures<Person, String> p) {
            // Note: We are returning an ObservableValue, not the value itself!
            return p.getValue().lastNameProperty();
        }
    };
```

```
firstNameCol.setCellValueFactory(callback);
```

Alternatively...

```
firstNameCol.setCellValueFactory(new PropertyValueFactory("firstName"));

// PropertyValueFactory uses reflection to attempt to find either a
// firstNameProperty() method that returns the correct type, and if that
// fails, it will attempt to return getFirstName() / isFirstName().

// Of course, getFirstName() returns a String, not an
// ObservableValue<String>...

// So, we wrap using a ReadOnlyObjectWrapper
// You can do this too if your objects aren't JavaFX classes
// The downside is that the UI won't update dynamically
```

Visualization of data

- Controls can visualize
 - Different kinds of data (ListView<T>)
 - From different sources (file, database, network)
 - In different formats (XML,CSV,JSON)
 - With different dynamic capabilities (static versus dynamic)

Examples of datasources

In-memory arrays:

```
String[][] people = new String[][] {  
    {"Jonathan", "Giles", "jonathan.giles@oracle.com"},  
    {"Johan", "Vos", "johan@lodgon.com"}  
};
```

CSV Data:

- [show example of large file]

XML Resource:

- [show online XML resource]

Retrieving/parsing/rendering

- Retrieving, parsing and rendering data are three different tasks.
- These tasks are domain-agnostic
- JavaFX Controls provide a way to render data
- JavaFX DataSources project provides a way to retrieve and parse data by providing abstractions for a number of sources and formats

Retrieving and parsing

- Retrieving data:
 - File, local/remote database, network resources
- Parsing data:
 - XML, JSON, CSV, Java Objects

Retrieving Data

- Retrieving data:
 - File, local/remote database, network resources
- Javafx.datasource.io package contains a number of different (physical) sources.
- DataSource classes do not know what parts of the data are needed
 - a JDBC based resource contains many columns, but only 2 of those should be rendered in a TableView
 - An XML resource contains structured information, but not all elements/attributes should be rendered

Mapping Data with Controls

- `Javafx.datasource.control` package contains wrappers that gather the application-specific relevant portions of the data and provide those to the JavaFX Controls
 - Column headers match the CSV headers
 - Column headers can be mapped with XML elements or attributes (Xpath)
 - Column headers can be mapped with database column names
 - ...

Static versus Dynamic

- Some data elements are static
- Some data elements are dynamic
 - Update requested by control (pull)
 - Update requested by datasource (push)

RedFX

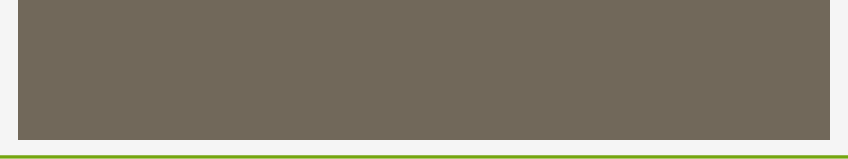
- Library that allows remote synchronization of data
- If the value of a data element changes on one client, or in a backend component, the same element is updated on all other clients
- Using Binding, the visualized data is updated immediately

Examples

- Code + demo shown for
 - ArrayDataSource
 - CSVDataSource
 - JDBCDataSource
 - XmlFileDataSource
 - XmlRESTDataSource
 - JSONRESTDataSource
 - RedFXDataSource

Cell Factories

- Common API across ListView, TreeView, TableView
- Responsible for displaying a single row/cell in a control
 - ListView: One cell per row
 - TableView: One cell per row + one cell for each column
- Default cells call toString() on the cell.item object
- Custom cells can do anything...



Creating a Cell Factory

```
// todo  
todo
```

Common Cell Factories

- Ranked in order of important (imho):
 - Text editing
 - Check box
 - Drop-down menu
 - Context-specific rendering (red for negative, green for positive)
 - Images
 - Progress bar
 - Expand-on-click
 - Everything else...

Common Cell Factories

- Ranked in order of importance:
 - ✓ Text editing
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 - ✓ Images
 - ✓ Progress bar
 - ✓ Expand-on-click
 - ✓ Everything else...

EnergyCo Demo

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What's Next?

- Current implementation is read-only.
- Write support can be imagined simply as list write operations.

- Support for TreeView API
- Support for Charts API

- More data sources
- More cell factories
- More convenience

Where Can I Get This?

- This is a free, open source project built on top of JavaFX 2.0
- It is **not** an Oracle-sponsored project
- BSD-ish license (we are not lawyers) – contact us if you're concerned
- It can be downloaded right now:
<http://javafxdata.jonathangiles.net>

Thanks

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